Announcements

- EXAM 2 *tomorrow*!
- No new homework…

  CQ11: ΔV_{12} *increases*
  31.24: (600/11) Ω
  31.59: see solutions
  31.60: see solutions

- Office hours…

  MW 10-11 am
  TR 9-10 am
  F 12-1 pm

- Tutorial Learning Center (TLC) hours:

  MTWR 8-6 pm
  F 8-11 am, 2-5 pm
  Su 1-5 pm

Outline…

CH 29 – Potential & Field

- Connecting Potential and Field
- Sources of Electric Potential
- Finding the *E*-field from the Potential
- A Conductor in Electrostatic Equilibrium
- Capacitance and Capacitors
- The Energy Stored in a Capacitor

CH 30 – Current and Resistance

- The Electron Current
- Creating a Current
- Current and Current Density
- Conductivity and Resistivity
- Resistance and Ohm's Law

CH 31 – Fundamentals of Circuits

- Circuit Elements and Diagrams
- Kirchhoff's Laws and the Basic Circuit
- Energy and Power
- Series Resistors
- Real Batteries
- Parallel Resistors
- Resistor Circuits

Ch. 29

$V \equiv U_{q+source}$

$V = \frac{U}{q}$

$\Delta V = V_f - V_i = -\int_i^f \vec{E} \cdot ds$

$\Delta V_{Bat} = \frac{W}{q} = \mathcal{E}$

$E_s = -\frac{dV}{ds}$

$\Delta V_{loop} = \sum_i \Delta V_i = 0$

$C \equiv \frac{Q}{\Delta V_C} = \frac{\epsilon_0 A}{d}$

Parallel $C_{eq} = C_1 + C_2$

Series $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$

$U_C = \frac{Q^2}{2C} = \frac{1}{2} C (\Delta V_C)^2$

$u_E = \frac{1}{2} \epsilon_0 E^2$

Ch. 30

$N_e = i_e \Delta t$

$i_e = n_e A v_d$

$v_d = \frac{e\tau}{m} E$

$i_e = \frac{n_e e^2 \tau A}{m} E$

$I = \frac{dQ}{dt} = \frac{\Delta Q}{\Delta t} = i_e e$

$J = I/A = n_e e v_d$

$\sum I_{in} = \sum I_{out}$

$J = \sigma' E$

$\sigma' = \frac{n_e e^2 \tau}{m}$

$\rho = \frac{1}{\sigma'}$

$I = \frac{\Delta V}{R}$

$R = \frac{\rho L}{A}$

Ch. 31

$P_{Bat} = I\mathcal{E}$

$P_R = I \Delta V_R = I^2 R = \frac{(\Delta V_R)^2}{R}$

Series $R_{eq} = R_1 + R_2$

Parallel $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$

$\Delta V_{Bat} = \mathcal{E} - Ir$

Q1

The numbers below indicate the electric potential (in Volts) at different places in a region of space. From this information, we can conclude

100	100	100	100	100
90	90	90	90	90
70	70	70	70	70
20	20	20	20	20

1. The *E*-field points to the right and is constant.
2. The *E*-field points down and is constant.
3. The *E*-field points up and is increasing downward.
4. The *E*-field points down and is decreasing downward.
5. The *E*-field points down and is increasing downward.

Q2

If the charge on a parallel-plate capacitor is doubled:

1. The capacitance is halved.
2. The capacitance is doubled.
3. The *E*-field is halved.
4. The *E*-field is doubled.
5. The surface charge density does not change on either plate.

Q3

Conduction electrons move to the right in a certain wire. This indicates that:

1. The current and the *E*-field both point right.
2. The current and the *E*-field both point left.
3. The current points right and the *E*-field points left.
4. The current points left and the *E*-field points right.
5. The current points left, but the *E*-field is unknown.

Q4

Of the following, the copper conductor that has the least resistance is

1. thin, long, hot
2. thick, short, hot
3. thick, long, hot
4. thick, short, cool
5. thin, long, cool